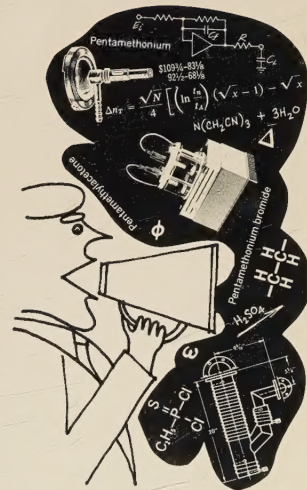




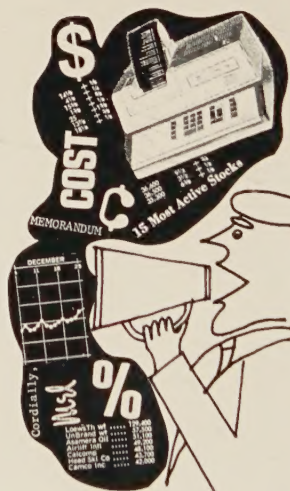
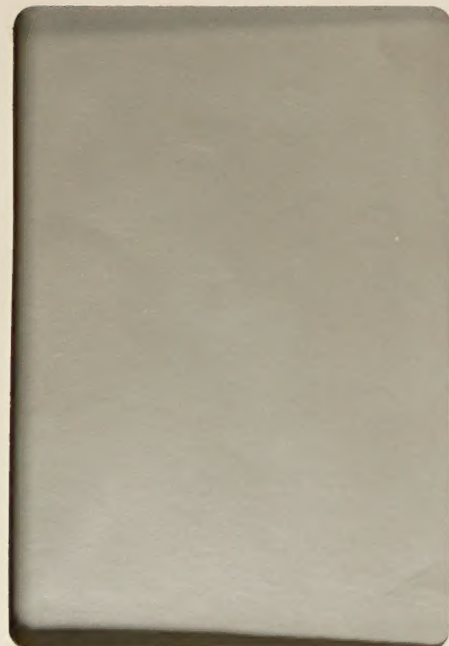
The Scientist in an Industrial Environment 15

Carl Pacifico

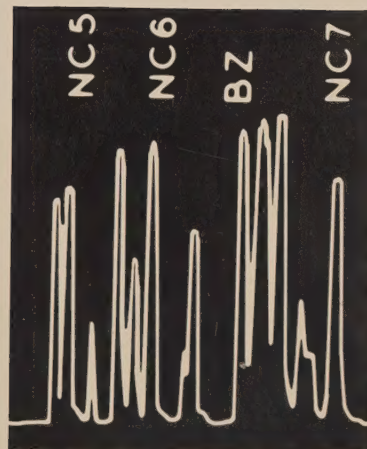
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- "Zig Zag Thinking" is a problem-solving technique that leads to results such as "The way to maximize revenue on a toll bridge is to stop collecting half the tolls."
- "Technological Forecasting—Tires" exemplifies the several techniques for planning and evaluating future R&D paths. The article is about tires, but the techniques are generally useful.
- A promising, convenient means for mothproofing clothing without the use of chlorocarbons is described by Rader and co-workers in "Ammonium Quats for Mothproofing." Their technique for handling human toxicity problems by circumventing them is particularly interesting.
- "Urea Technology" reviews the state of the art and provides a splendid case history of how commercialization of an apparently simple chemical process encounters and solves technical problems. In the case of urea these problems arise from the several equilibria that are involved, the corrosive nature of the solutions, and the necessity of handling solids.
- The article on "Solder Glass" might hold unique solutions for a number of problems encountered in the lab. and pilot plant since these materials have not yet been extensively applied in these roles.
- The analytical technique described by McAuliffe portends many applications beyond "Determination of Dissolved Volatile Materials." This would be particularly true were it possible to extend his phase equilibration technique beyond ambient temperature and pressure.
- The all-too-common inconveniences of carrying out reactions at superatmospheric pressures are addressed in "High Pressure R&D on Wheels." Some rather elegant solutions are depicted.
- A unit process that separates at the molecular level without phase change is described in "Membrane Ultrafiltration." This article begins a series on applications in food processing.



□ In our second article Carl Pacifico starts a four-part series on survival in industry. Here he likens the scientist in industry to an immigrant, cultured by his peers, entering a new land. He goes on to describe objectives and mores of both cultures as the basis for future articles.



**On-Line Analysis of Cat
Reformer Streams by GC 93**

R. D. McCoy, L. B. Roof, and
B. O. Ayers

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☐ This month we lead off with a guest editorial by Professor Linnell of the University of Southern California. In "The University's Role in the Supply-Demand Cycle," he recommends a "Birth Control Pill for Professors."

☐ The second article by a banker, nee chemical engineer, compares the economic performance of 15 successful specialty chemical firms with 6 of the giants. This article tempers much current myth with fact.

☐ Two authors from Hercules define the Technical Report as "a communication medium which leads to action." Means for orienting its form and content in accord with this view are outlined.

☐ In "Matrixarchy" the author of "Standard Methods for the Medico Science Manager" presents some scorching thoughts on corporate organizational structures.

☐ Mr. Philo, a well-known plaintiff attorney in product liability cases, discusses the role of the legal profession in designing safety into products. This article should lend useful perspective to anyone involved in producing a product—chemical or mechanical—for sale.

☐ Chemicals and processes used to impart durable press to cotton fabrics are detailed by a member of the staff of the Department of Agriculture. His text clearly relates reaction mechanism with process considerations.

☐ Dack's article provides a terse guide to the selection of reaction solvents . . . with some novel approaches.

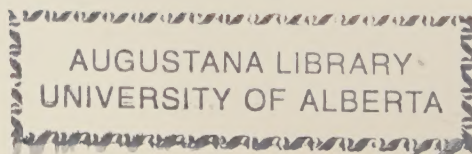
☐ Messman discusses the possibility of using the high temperature volatility of caustic soda to desulfurize coal. The economic implications are intriguing.

☐ An example of zig-zag thinking is presented by Talmage of Badger in his demonstration that one can render an explosive gas mixture harmless by adding another fuel.

☐ This month's kinetics article is by a Fordham undergraduate. Miss McLaughlin presents a general computer program for handling four concurrent reversible reactions.

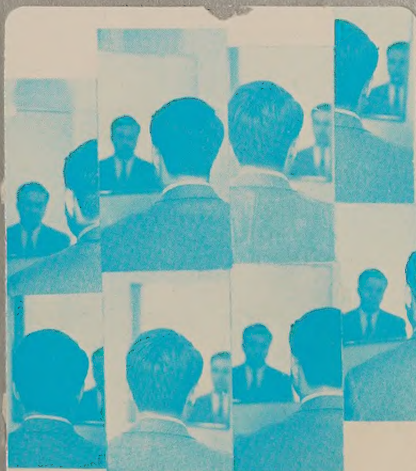
☐ "Polymer Molecular Weight from Refractive Index" by Rhein and Lawson demonstrates that reciprocal, number average molecular weight is a simple linear function of polymer refractive index.

☐ In "An On-line Computer Control Chromatograph for Analysis of Cat Reformer Streams," details are presented for the internal workings of a system that automatically handles gasolines containing 60–120 components. It not only prints out a complete analysis every 30 min but also computes C_5^+ yield, octane, and the distillation curve.



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**Professionals
and the Corporation 136**

Bruce Gordon and Ian Ross

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☐ The interplay between chemistry and engineering during scale-up are exemplified with a frank view of the pitfalls that one always encounters. 141

☐ This discussion of the intimate relationship between language and our thinking processes demonstrates that many of our problems exist only in the way we sense and express them. 148

☐ The entire energy crisis is placed in perspective by examining the history of energy consumption. Prognostications are carried beyond the year 2000, and imply that an energy source that is not now in use will be required. 153

☐ One of the major pitfalls in the conduct of any R&D program is the fact that we are always shooting at a moving target, which is seen differently by those with different responsibilities. The need for establishment of "goals" *in advance of R&D*, and a clear, mutually understandable statement of these goals is handled with a pragmatic vocabulary. 159

☐ Significant properties of all of the commercially significant thermoplastics are compared by using series of graphs and tables. 165

☐ A discussion of the breadth of free-radical chemistry in commercial processes is followed by a description of the initiation step of the process. Other steps will be treated in future articles. 176

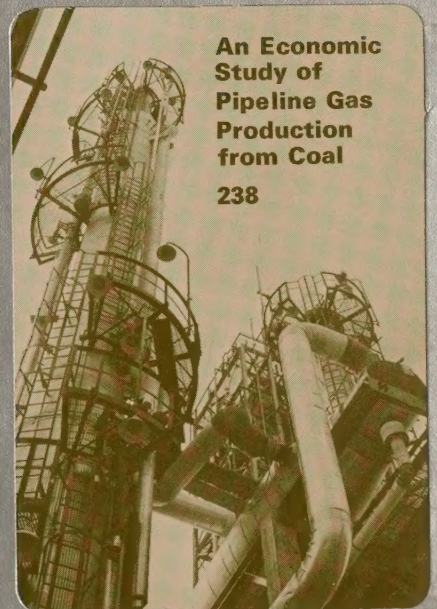
☐ Success with addition of various polymers to provide sites to hold optical bleaches is reported. 181

☐ The pitfalls of using lab data for plant design is exemplified in the case of a trickle-phase reactor, and an empirical solution is detailed. 185

☐ The lead article is a classic in which the differences among the professional, the artisan, and the protege are clearly delineated. It provides good food for thought in this period of reevaluation of the role of our Society. 136

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☐ We are fortunate to have an expression on the present and future of
air quality from Dr. Middleton, a key member of the Environmental
Protection Agency. 204

☐ Although Frankel insists that the second article, on the metamor-
phosis of a small businessman to a large one, is not autobiographical,
we suspect otherwise. 207

☐ The vital place of patents in the chemical industry lends urgency
to the points raised by Hurd when he talks about the future of patents
on a worldwide basis. 210

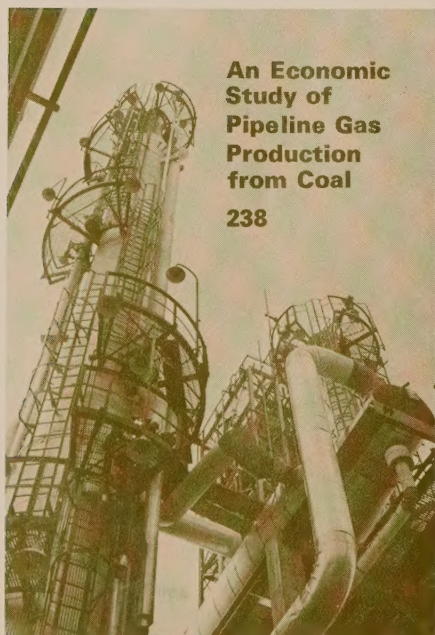
☐ The life history of molecular sieve catalysts in a variety of applica-
tions is traced by Paul Venuto in his IPATIEFF Award acceptance
address. 215

☐ A useful but little-known device for correlating all manner of data
is described by Steiger who treats the Weibull Distribution in pragmat-
ic terms. 225

☐ The several types of chemistry that are being induced on a semi-
commercial scale by electric discharge are reviewed by Bradley.
Packaging, fiber treatment, and film modification are among the
subjects treated. 232

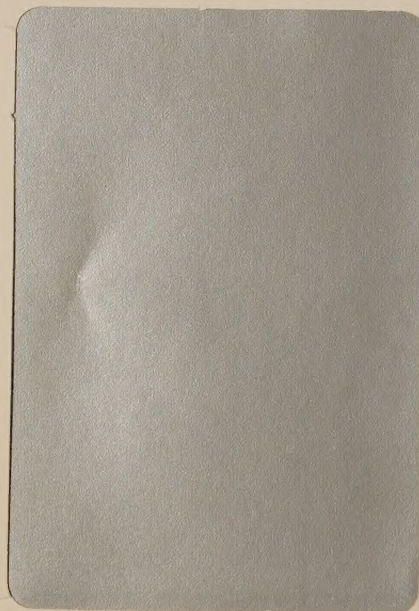
☐ In the second of our series on microfiltration, Porter and Michaels
detail applications to processing of dairy products. Particular
emphasis is placed on effluent problems. 248

☐ One factor that is critical in commercial gasification of coal—energy
consumed—is treated by Henry and Louks in their comparison of the
several processes that are now under consideration. The anticipated
acute shortage of natural gas and associated cost increases make
this analysis most timely. 238



**An Economic
Study of
Pipeline Gas
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238**

J. P. Henry, Jr.
and B. M. Louks



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Michael S. Tswett, 1872-1919



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A history of a
parallel development 280

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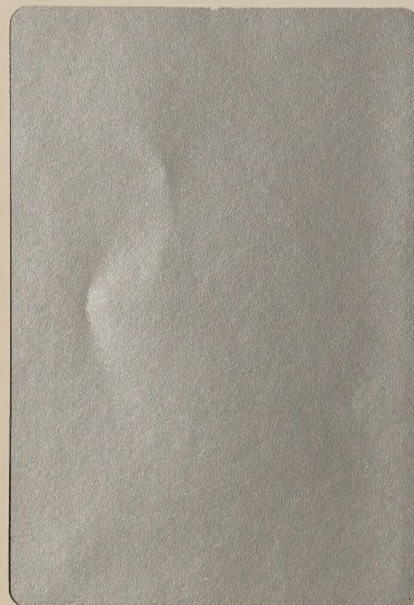
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☐ It is appropriate in this age of reexamination of the role of chemistry to look at the training of chemists. Siebring and Schaff here report on the baccalaureate origins of eminent chemists with intriguing results. 266

☐ Pacifico continues his series on guidelines for the non-entrepreneurial professional in this second installment. 270

☐ Some of the significant socio-economic problems that face the chemical profession are addressed from Pitzer's unique point of view. Candidate solutions are, of course, also detailed. 273

☐ Specific areas of industry irritation in today's pesticide registration procedure are detailed by MacDougall. 278

☐ Progress in relating homogeneous and heterogeneous catalysis is continuing apace. In his Murphree Award Address, Heinemann gives us a status report. 286

☐ The pitfall of an improper model is exemplified by Parker who demonstrates that elimination reactions can be strongly catalyzed by bases that are weak . . . toward protons. 297

☐ The characteristics of marketing a specialty chemical, particularly interactions between development and sales staffs, are exemplified by Paradiso in talking about the dye industry. 292

☐ Dolinski and Dean treat electrically conductive polymers and detail their use in photoreproduction. It would seem that these polymers would have other applications. 304

☐ Implications of extending the Product Manager's responsibility into areas of product liability is explored by Woods. 310

☐ Surprising changes in metal properties brought about by minute additions of rare earth metals are illustrated by Hirschhorn. The myriad uses of resulting alloys outside the CPI portends growing use in process equipment. 314

☐ The maturation of chromatography, as discussed by Sister Virginia, provides an interesting history of parallel development. 280



**The First
Viral Pesticide:
A Case History**

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☐ This month Ettinger aims his barbs at pollution of the literature and concludes, "If you can't beat 'em, start a new publication." 330

☐ The director of the Materials Advisory Board of the National Academy begins by noting that each age derives its name from the materials it used, and proceeds to name us accordingly. 332

☐ Professor Johnson's lengthy experience in fermentation is used to forecast its future technology with exciting portent. 338

☐ Why people work and how they can be motivated to work better is Rigby's subject. 348

☐ How Dow handles the introduction of a new monomer is described by Yocum, who points out how one company's bread can be another's anathema. 358

☐ The problem of predicting melting point from structure is attacked fruitfully for the first time by Eaton. 362

☐ The inventive process, as exemplified by the genesis of novel separation schemes, is traced by Edwards, who concentrates on the concept of novelty in this first installment. Next month he concludes with case histories on the genesis of some newer separation schemes. 367

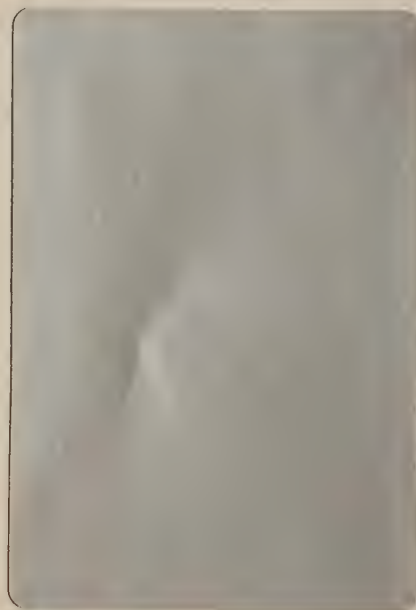
☐ Lloyd continues his coverage of the uses of Free Radical Processes in this treatment of substitution reactions. 371

☐ Development of the first viral insecticide approved by FDA is traced by Greer, Ignoffo, and Anderson. 342



The First Viral Pesticide: A Case History

Frances Greer,
Carlo M. Ignoffo,
and Ralph F. Anderson





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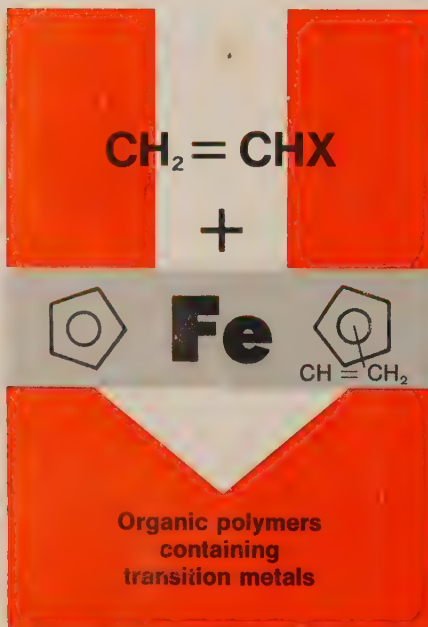
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M. C. Porter and A. S. Michaels



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☐ Al Glueck addresses the question "Why not use the computer?" 392

☐ Reports are a lot easier to write (and to read) when the reason for writing them is clear. Henderson details one oft overlooked but important reason. 394

☐ An inside look at the patent situation is provided by the U.S. Commissioner of Patents, W. E. Schuyler, Jr. 398

☐ What's been happening to elastomers and what does it portend? D'lanni addresses the question authoritatively in detail. 401

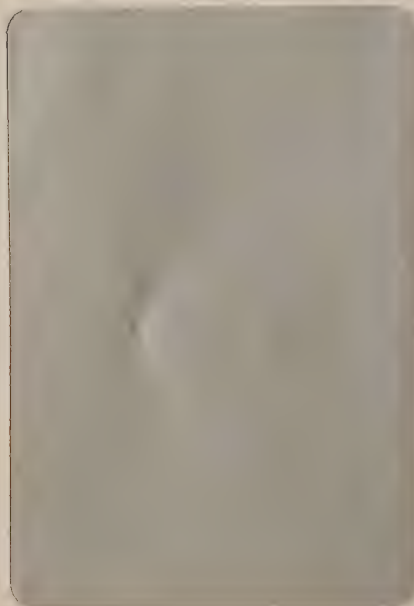
☐ Since little real progress has yet been made in handling plastic wastes, Rodriguez's technical statement of the problems is particularly timely. 409

☐ Polymers have been made from organometallic monomers and preliminary study of their properties suggests a variety of potential uses according to Pittman. 416

☐ Last month Edwards discussed concepts of novelty. Here, he relates these concepts to recent separation schemes that rely on membranes, and points out that every manufacturing process involves at least one separation. 425

☐ Whenever one body in contact with another moves relative to it, wear occurs. The principles underlying this omnipresent phenomenon are untangled by Shaw in the hope that wear can be better controlled. 432

☐ In this third of our series on membrane ultrafiltration in food industries, Porter and Michaels discuss experiences in processing meat by-products. 440

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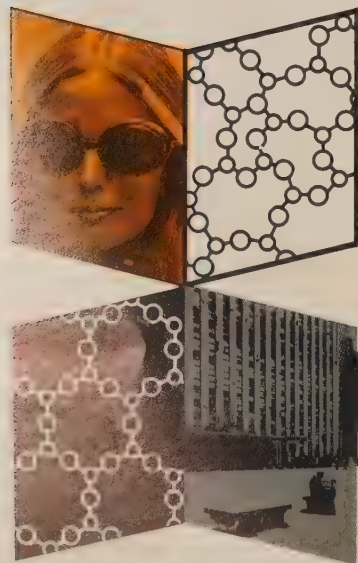
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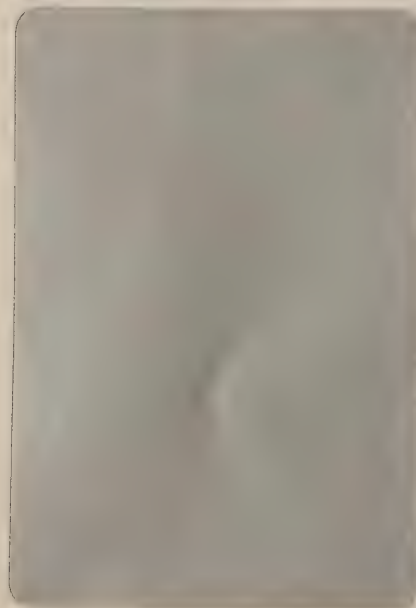
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☐ In this third paper of the series on "The Scientist in the Industrial Environment," Pacifico reveals aspects of conflict among scientists' objectives that exist without any help from business. 466

☐ Friend refers to the data book as "the process engineer's brains." How these brains have grown and been utilized in some typical design situations are the subject of his engaging paper. 469

☐ Everyone thinks of Borodin as a composer. What is less well known is that music was this chemist/educator's hobby. Steinberg discusses his work in science. 473

☐ Business models are the tools used to determine whether a project is Go or No-Go. Here Friedman illustrates the use of such a model in comparing Chemical Specialties with some other risk ventures. 476

☐ What does one do when he wants developmental quantities of a compound, or when his plant goes down, or when start-up of the new plant is delayed, or when demand surges unexpectedly? Custom Synthesis could be the answer according to Goss, who illustrates how the whole procedure works. 480

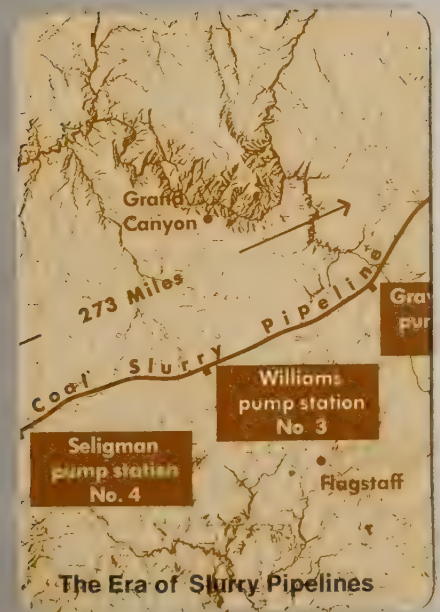
☐ Chemical rate data are at best difficult to untangle whether you're looking for a reaction mechanism or a process design. Here Pitcher, a mathematician, and Cooper, a chemist, give the kineticist another tool. 484

☐ Recently there has been a lot more applied chemistry in electrical batteries than is often realized. Murphy's overview of batteries is particularly timely in view of their growing use in vehicles—terrestrial and otherwise. 487

☐ Nuclear power, but recently a commercial and social reality, is examined by AEC's Commissioner, Theos Thompson, whose untimely death occurred shortly after he prepared this manuscript. 495

☐ "The next power plant pollution problem," nitrogen oxides, is delineated by Crynes and Maddox, who describe the kinds of compromises that seem necessary. 502

☐ Glass has become pretty ubiquitous stuff, due in large part to the work of Stookey. In this award talk he discusses several of the capabilities of glass through case histories of the R&D that led to profitable applications. 458



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Elements in the Chemistry of Bioluminescence 563
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Five-Coordinated Carbon: Key to Electrophilic Reactions at Single Bonds 566
George A. Olah

Check List

☐ One uniquely human characteristic is the ability to plan for relatively distant futures. Failing to exercise this ability is also uniquely human. But, the coming complexity of human works demands that we do plan. Zettel's treatment of Technology Assessment expands on this theme for our profession. 520

☐ Try Brandt's Plan—Four Letter Words—the next time you face a writing task. 528

☐ An extreme of the adage "The analysis is no better than the sample" is addressed by Kane, whose "samples" are microminature electronics components. His thesis: It's not what you've got, but where you've got it. 532

☐ Perlman looks at the drug scene—medicines, that is—so that, as Tishler recently paraphrased Lincoln [*J. Chem. Doc.*, **11**, 134 (1971)], "If we know from whence we came, perhaps we can answer the question wither." 540

☐ A new department—"Challenge"—is introduced with Cherkin's article on problems at the interface between behaviorists and chemists, both of whom are concerned with psychodynamic drugs. In the future, "Challenge" will delineate a diversity of significant but persistent *problems* in science and technology; economics and instrumentation. All merit new approaches, whose development can come only from an appreciation of THE problem. 549

☐ Fireflies fascinated Sutterby, so he did a study on them and won a student paper contest. 563

☐ Olah brings a lot of organic chemistry into focus in this comprehensive review of the carbon atom with *five* nearest neighbors. 566

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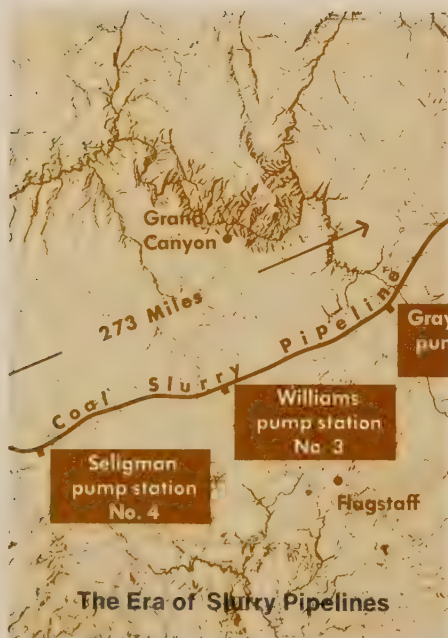
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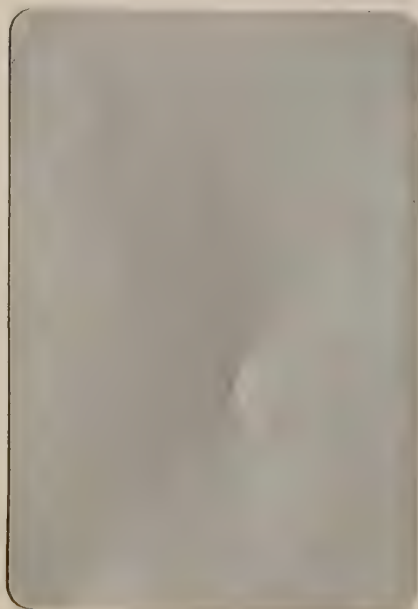
Challenge—Memory Research:
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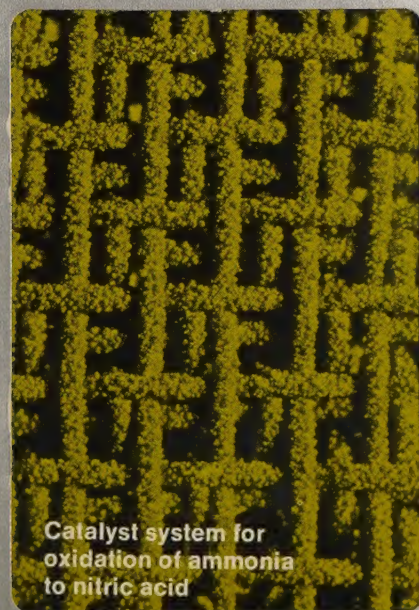
E. J. Wasp,
T. L. Thompson,
and P. E. Snoek



☐ Solids are now flowing in pipes that are hundreds of miles long. Wasp, Thompson, and Snoek discuss the scope and limitations of this technology as an introduction to new applications. 552

CHEMTech

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Catalyst system for
oxidation of ammonia
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Heterogeneous Photocatalysis for Partial Oxidation of Paraffins 680

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Reducing Fluid Friction with Okra 697

Walter E. Castro and Joseph G. Neuwirth, Jr.

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☐ Since cost is the ultimate, critical variable in any mission-oriented program, it is fair to ask when it should first be considered. Katell outlines the cost engineer's earliest roles. 648

☐ The molecular architecture used to design thermally stable polymers for fibers and fabrics is explored by Preston. The demand for such materials keeps appearing in diverse areas. 664

☐ The Input/Output business model asks: "Who is doing what and to whom?" Here, Gols exemplifies its operation in examining those chemical and other components of the forest products industries. 656

☐ Electrochemical techniques are identifying and solving effluent problems. Siegeman demonstrates a variety of such techniques. 672

☐ Often conceptual simplification of the problem hides its solution. How this can occur in one common way of handling data is clearly shown in the caveat of Cooper and Winkel. 660

☐ Okra, of all things, has been found to exert profound hydrodynamic effects. Its promise in reducing pipe and pump sizes and pumping costs are explored by Castro. 697

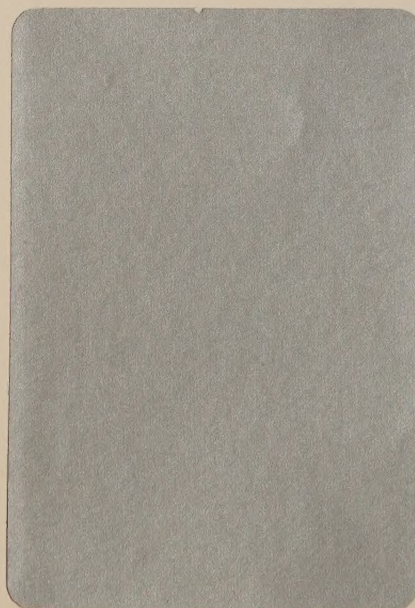
☐ Photo and heterogeneous catalysis are well established in their own rights; when they are combined surprises abound. Here a group of French authors, under Professor Teichner, discuss their research on oxidation of paraffins. 680

☐ Lloyd's series on free radical chemistry concludes with an overview of the most widely used reactions of this type—polymerization. 687

☐ Sociologists see significant life-style changes coming for us. Not only are there more wage earners per family, but more jobs per wage earner—some concurrent, some sequential. Abbott shares his experiences in helping many to develop second careers. 650

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John Abbott



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Applications**



Karl Kammermeyer

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☐ Knowing how mistakes happen can go a long way in preventing them. Rigby traces the origins of errors with this in mind. 712

☐ That the solution to environmental problems requires critical examination of the operation as a whole, has now been widely recognized. The requisite *systems approach* to pollution is employed by Greenberg in his study of steel production. 728

☐ Any timely consideration of the CPI must take account of its global character and should include the Eastern European nations. Geacintov here examines the market potentials and strategies that are unique to these countries. 737

☐ It has often been said that if control of the earth is to be wrested from man it will be the insects who will do the wresting. On the other hand, current insecticides are causing significant environmental concern. Bergmann's prognostications, based on our improving understanding of insect metabolism, address this dilemma and provide massive challenge for several disciplines. 740

☐ Unresolved peaks are not only problematical in gas chromatography but also in spectroscopy and elsewhere. Grushka shows how to recognize their presence and effect their resolution. 745

☐ There is a new device that Hammond feels holds great promise in water desalination. However, it has implications for other evaporative processes as well. 754

☐ The way in which some catalysts work is detailed by Mango who shows how catalysts can expedite reactions that are otherwise forbidden by symmetry restrictions. 758

☐ The interplay among chemistry, engineering, and medicine is nowhere more urgent than in the field of materials for human prostheses. Kammermeyer here presents an overview of exemplary cases and critical factors in their handling. 719